

Device for communication between a television receiver and a telephone set

The device for communication between a television receiver (100) and a telephone set (200), on the one hand, transfers alphanumeric characters from a television picture signal through the telephone set (200) and, on the other hand, transmits characters received by the telephone set (200) via a telephone network or entered via its input panel (201) to the television receiver (100).

The television receiver (100) has a reading device (109) and a character transmitter (117) with a transmission element (118). The reading device (109) contains an analog/digital converter (111), a pixel memory (112) and an analyser (114) which analyses the stored digital values of the CVBS signal and converts recognised alphanumeric character sequences into binary-coded characters transmitted by the character transmitter (117) in the form of a data signal (DS) to the telephone set.

The telephone set (200) contains a microcomputer system (203) with memories (204, 205), a coding and modulating device (208) for generating remote signals (RS) for the television receiver (100), an infrared transmitter (209) for transmitting the remote signals (RS) and means (211, 212 and 213) for receiving and converting the data signal (DS) into signals which can be transmitted on a telephone channel in a telephone network and/or can be stored in the memories (204, 205) of the second microcomputer system (203).

activities, it is not possible to proceed with the appropriate degree of care. This can lead to rash actions which sometimes cannot be undone.

Devices are already known in which a television receiver is connected to a telephone set in order to transfer information from the telephone set to the television receiver.

E.g. DE-C2-36 34 836 discloses a remote-control device for a cable television system in a hospital, in which a patient can switch a television receiver in his room on and off, change over to a different programme site and connect the sound connection thereof to his headphone connection with the aid of a telephone set. This is effected by entering the appropriate digits into the dialling device of the telephone set. The telephone system transmits these digits to a central detection and control device which then transmits corresponding control commands in the form of serial pulse telegrams via separate data lines to a remote-control device situated in the relevant room. The remote-control device has means for receiving, decoding and evaluating the digital remote signals, which actuate a remote-control transmitter.

With the exception of the input panel, the remote-control transmitter contains all of the devices of a cordless remote control for television sets, the information being provided via an actuated key via the telephone system which transmits corresponding operating commands to the television receiver. At the same time, an acknowledgement is transmitted via the data line to the central detection and control device in order to determine, e.g. the connection time of premium programmes. The aerial lead-in of the television set or the lighting circuit can also be used as the data line.

According to a development of the invention, additional functions are also performed, e.g. controlling teletext displays. E.g. the patient can therefore request hospital-specific or patient-specific teletext pages or pictures on a specific special television channel to which only the corresponding telephone connection has access at the time of the query by means of the selecting device of the telephone set via the detection and control device. E.g. a menu can therefore be displayed on the screen and the patient can select his meal via the push-buttons of the telephone set. A doctor can request the case notes for the respective patient and have them transmitted to the

hospital room or the patient can have his telephone and television account displayed on the screen.

In the device described, the remote-control device is always actuated via the telephone network, the detection and control device and the additional data line. There is no direct actuation of the television receiver via the telephone set. A device of this kind is therefore not suitable for use in private households.

It is also impossible for information transmitted by the television signal to the television receiver to be transferred to the telephone set.

DE-C2-38 19 863 furthermore discloses a device for the remote control of an electronic device, in particular a video recorder, in which control information, such as channel number, date, start and end time of television programmes to be recorded, can be transmitted via a general telephone network from an external telephone set to a telephone set situated at the location of the device.

The telephone set at the location of the device has a control device to which a remote-control transmitter for the wireless transmission of remote signals to the electronic device is connected.

In this device once again, there is no direct actuation of the television receiver via the telephone set and it is also impossible to transmit information to the telephone set at the request of the viewer.

A method of simplifying the programming of video recorders is furthermore known from the printed publication RUNDfunkTECHNISCHE MITTEILUNGEN, Vol. 30, No. 5, Sept.-Oct. 1986, pp. 223-229, Norderstedt, DE; G. EITZ et al.: "Videotext programmiert Videoheimgert (VPV)" [Home video programming by teletext]. The recording requirements are entered by automatic transfer of the required information from teletext programme pages on which a desired item is advertised. The video recorder is controlled by the VPS data also transmitted in the data line 16. Operation is simplified in that the viewer marks the desired item on a selected teletext programme page with a remote control.

After that, the video recorder automatically programmes the information contained in the teletext pages. Although the method selectively evaluates alphanumeric characters transmitted by the television picture signal and uses these to initiate specific activities, this is only possible with the aid of a corresponding teletext page. There is no communication link between the two devices.

The aim of the invention is to provide a device for communication between a television receiver and a telephone set allowing for the selection of inserted data received by a television receiver via the picture signal by means of the input panel of a television set in order to transfer this data directly by means of the telephone set together with other data identifying specific operating states of the television receiver and to transmit signals received by a telephone set via the input panel or a telephone channel to the television receiver.

Nature of the invention

When solving the problem, the invention departs from the following facts:

With the developments in the field of mobile telephones, many households have access to very handy telephone sets which can be operated in a cordless manner and already contain a plurality of electronic means which, with a little additional technical work, are additionally suitable for use as remote controls in a remote-control system.

A mobile telephone known per se has an input panel for numeric characters and for special characters for control functions, a multi-line display for alphanumeric characters and a microcomputer system with the corresponding wiring, such as storage circuits and software and hardware components for receiving, decoding, storing, coding, outputting and displaying information in the form of signals and characters.

A television receiver with a screen and a remotely controllable digital tuning and storage system also has a microcomputer system with storage circuits for receiving, decoding, storing, coding and emitting signals and displaying information in picture form.

The invention solves the problem in that a coding and modulating device for generating remote signals for a television receiver is additionally arranged in a telephone set of this kind and is connected to an infrared transmitter. The telephone set according to the invention furthermore contains a receiver for cordless reception and for converting data signals into signals which can be transmitted on a telephone channel and can be stored in the memory of the telephone set.

The television receiver contains a reading device by means of which part of the picture signal can be selected, digitised and stored. This part of the picture signal consists of identical time intervals of successive picture lines of the active line signal, each having the same temporal position relative to the line-synchronising signal. The output of the reading device is connected to an analyser. The analyser contains a microprocessor which analyses the signal structure of the stored part of the picture signal and compares it with internally stored structural patterns.

Data in the form of alphanumeric characters inserted into the active picture signal can thus be recognised and converted into sequences of binary-coded characters. A character transmitter in the television receiver codes, modulates and transmits these characters to the telephone set.

The device according to the invention therefore serves, on the one hand, for the transmission of alphanumeric characters from the picture signal of the television receiver to the telephone set and, on the other hand, for the transmission of signals from the telephone network and signals entered into the input panel of the telephone set to the television receiver.

In contrast to known solutions, the telephone set according to the invention itself converts the entries made via the keyboard into signals and transmits these directly to the television receiver.

In a development of the invention, the microcomputer system of the television receiver is designed in such a manner that it controls the course of a communication process automatically by means of a display menu on the television screen and a cursor system. Required data inputs can thus be requested by the user and information produced as a result of the communication displayed, on the one hand, in

a simple manner by means of the display in the telephone set and, on the other hand, in a convenient manner using the television screen.

Preferred embodiment of the invention

The invention will now be described by way of one embodiment. In the associated drawings:

Fig. 1 is a block diagram of the basic design of a television receiver according to the invention;

Fig. 2 is a block diagram of the reading device of the television receiver according to the invention;

Fig. 3 shows an extended embodiment of a television receiver according to the invention, and

Fig. 4 is a block diagram of a telephone set according to the invention.

A television receiver 100 known per se shown in Fig. 1 with a remote-control system contains an HF receiving component 101 for receiving and demodulating a television signal which is modulated by a CVBS signal, a video signal component 102 which extracts an RGB signal from the CVBS signal in order to actuate a picture tube 103 with a screen 104 and, alongside an audio component (not shown), a digital tuning and storage system which, together with a microcomputer system 105, forms the central unit of the remote-control system and allows, e.g. via a data bus 106, for the switching on and off of the television receiver 100, the selection of the broadcasting station, the varying of setting values for picture and sound and the switching over to specific functions of the device.

The microcomputer system 105 contains in a known manner a decoder for remote signals RS, memories for transmitting frequencies and picture and sound setting values, memories for picture signal patterns for displaying alphanumeric characters on the screen 104 and a processor for executing and controlling the functions of the television receiver 100 and can be actuated via a remote-control receiver 107 with an infrared sensor IRS by means of infrared signals.

The television receiver 100 furthermore also contains a teletext component 108 for separating, decoding and storing teletext signals from the CVBS signal and generating and RGB signal for displaying teletext pages on the screen 104.

In addition to these known modules, the television receiver 100 according to the invention contains a reading device 109 for selecting, storing and analysing time intervals of the CVBS signal. The reading device 109 allows serial time intervals of the CVBS signal in which caption insertions with a text line are situated and which represent a band in the television picture to be selected, optically marked, digitally stored and evaluated by the remote-control system.

The reading device 109 can be designed, e.g. as shown in Fig. 2. It contains a gate circuit 110 with a signal input and a control input, an analog/digital converter 111, a pixel memory 112, a read-out controller 113 and an analyser 114. The CVBS signal is present at the signal input of the gate circuit 110. The control input of the gate circuit 110 is connected to the read-out controller 113 and serves to generate a data window which activates the gate circuit with both fields for the time intervals with the inserted signal of a text line. This is effected by means of a control signal generated within a field by the read-out controller 113 by way of the current line number of the currently transmitted picture line. To this end, the read-out controller 113 is connected to the vertical and horizontal synchronising signal V_{Sync} and H_{Sync} separated from the CVBS signal in the video signal component 102, and to the data bus 106. The read-out controller 113 therefore controls the times in which the gate circuit 110 transfers the CVBS signal to the input of the digital/analog converter 111. It contains a picture line counter for determining the line number of the currently transmitted picture line and a comparator which compares the current line number with reference numbers identifying the set position and the width of the selected band.

The microcomputer system 105 provides the reference numbers via the data bus 106, wherein these can be varied by means of the remote-control system and pre-set to common values so that the width and position of the band can be set in a simple manner by means of cursor keys on the input panel of a remote control.

Whereas the gate circuit 110 for the CVBS signal is transparent, the microcomputer system 105 marks the position of the band in the television picture, e.g. by means of colour and/or brightness shifting on the screen 104, by way of the reference numbers set. Activation of the gate circuit 110 means that the CVBS signal is only present at the input of the analog/digital converter 11 at the time during which a relevant inserted text line is transmitted. The analog/digital converter 111 converts the CVBS signal into corresponding digital values during the selected time intervals and stores the latter in the form of a pixel signalling pattern in the pixel memory 112.

As caption insertions in practice never start or end directly at the edges of the screen, it is not necessary to read out the complete signal of the active picture lines from the picture lines of the band. The gate circuit 110 can be activated in such a manner that, e.g. the first and the last signal portions of the picture lines do not have to be digitised and stored.

Memory capacity and evaluating time can be saved in this manner.

The pixel memory 112 has a parallel data output at which the digital values of a plurality of successive picture lines can be retrieved simultaneously and to which the analyser 114 is connected. The latter contains a microprocessor 115 which is connected to a digital character pattern memory 116.

Reference structures of the picture signal of alphanumeric characters are stored digitally in the character pattern memory 116. The microprocessor 115 retrieves the digital values of the CVBS signal stored in the pixel memory 112 and compares these with the structures of picture signals stored in the character pattern memory 116. The alphanumeric characters contained in the television picture signal are thus recognised, converted into a sequence of binary-coded data and made available for retrieval at the output of the analyser 114.

As shown in Fig. 2, the analyser 114 contains a data output O_{dat} to which a character transmitter 117 comprising a coding and modulating device and a driver for actuating a transmission element 118 is connected. In the example shown, the transmission element is an infrared diode. However, in another embodiment of the invention, it can also be a transmitting aerial for an HF signal. The coding and modulating device

converts the binary-coded data into a data signal DS consisting of serial pulse words each with an address component and a data component in the character transmitter 117. The transmission element 118 transmits this data signal DS in a wireless manner.

The serial code words in the address component thus contain different addresses from the remote signals of the television receiver 100. This measure is necessary in order to prevent the code words emitted by the transmission element 118 from being transmitted back to the microcomputer system 105 of the television receiver 100 via the remote-control receiver 107 and causing control errors.

In order to increase the reliability of the recognition by the analyser 114, means for increasing the contrast which shift the distribution of the brightness and/or colour values in the luminance and/or chrominance signal towards extreme values can also be arranged in front of the pixel memory 112. This has the advantage that the influence of signal noises and brightness and colour patterns in the background of the caption insertion during analysing can be suppressed.

In the embodiment shown, the individual stages of the reading device 109 and the character transmitter 117 have been shown as separate signal stages for the sake of clarity of the invention. However, in the practical embodiment of the invention, it is advantageous to produce the greater part of these signal stages with the aid of the microcomputer system 105. This applies, in particular, to the read-out controller 113 and the analyser 114.

Deviating from the representation of Fig. 2, the reading device 109 can also be designed in such a manner that a band having caption insertions over several text lines is read out by the gate circuit 110. These time intervals of the CVBS signal are also converted by the analog/digital converter 111 and are stored in a correspondingly larger pixel memory 112. Before the analyser 114 analyses the stored digital values of the CVBS signals and converts recognised alphanumeric characters into binary-coded characters, the band stored in the pixel memory 112 is retrieved via the microcomputer system and is displayed on the screen 104 in the form of a still frame by a still frame signal generator (not shown in the drawings) also connected to a

cursor system. The relevant alphanumeric characters can then be marked for analysis by the cursor system and instructions for data management, such as the fixing of a storage address, a method of use and the like, can be provided.

Compared to the reading device first described, this reading device displays the reliability and ease of operation essential for the transfer of caption insertions, as supplementary data not provided for use in the telephone network, such as names, designations and addresses, can also be read out and stored.

In a development of the invention, as shown in Fig. 3, a teletext generator 120 is additionally connected to the data bus 106 of the television receiver 100 in addition to the modules already mentioned and is connected to a program memory 121 and a page memory 122 for teletext pages and a cursor controller 123. The page memory situated in the teletext component 108 can advantageously be used. The teletext generator 120 has a signal converter. This converts the binary-coded data arriving at the microcomputer system 105 in the form of code words for the remote-control system and corresponding to the optically displayable characters into the signal form of the teletext system.

Both the binary-coded data from the data output of the analyser 114 and the binary-coded data transmitted from the telephone set 200 to the television receiver by infrared means can thus be loaded into the page memory 122 of the teletext system.

The teletext generator 120 allows its own special teletext pages to be generated from this binary-coded data by means of generator programs stored in the program memory 121. These teletext pages can be stored in the page memory 122, displayed on the screen 104 of the television receiver in the form of special teletext pages upon request and processed by the cursor controller 123.

In a further development of the invention, the television receiver 100 has a device for marking and reading out caption insertions from the teletext component 108, the output of which is also connected to the character transmitter 117. A device of this kind is known from the programming system "Videotext programmiert Videoheimgarät (VPV)" [Home video programming by teletext] and therefore does not have to be described here.

Fig. 4 shows a telephone set 200 extended in accordance with the invention. In this embodiment, it is a mobile telephone containing in the known manner an input panel 201, a display 202 for alphanumeric characters stored or entered via the input panel 201, a microcomputer system 203 with a volatile memory 204 serving as a main memory, a non-volatile memory 205 for call numbers, names and addresses, an automatic dialling device 206 and a touchtone dialling device 207. A coding and modulating device 208 is moreover provided for generating remote signals RS which, with respect to the address component and data component, are similar to the code words generated by a remote control for the television receiver 100, but have an extended character set.

The coding and modulating device 208 can be formed by the microcomputer system 203 and is connected to an infrared transmitter 209.

The character set of the coding and modulating device 208 is extended in such a manner that additional characters are generated and can be transmitted via the remote-control system to the television receiver 100 in order to image them on the screen 104 in the form of text or graphics.

The telephone set 200 moreover comprises a receiving and transmitting device 210 by means of which a connection can be established with a telephone network.

According to the invention, the telephone set 200 contains a data receiver 211 for the wireless reception of the data signals DS emitted by the television receiver 100 via the transmission element 118.

The data receiver 211 is connected to a data decoder 212 and a data converter 213. The data decoder 212 decodes the data signal DS received and checks whether an infrared signal addressed to the telephone set 20 was received. In the case of a positive test result, the data converter 213 converts the characters transmitted by the data signal DS, stores them in the memory 204 of the microcomputer system 203 and displays them on the display 202. The result of the character analysis carried out by the analyser 114 can thus be checked. The data converter 213 converts the code words of the data signal DS into signals suitable for use in the microcomputer system 203 in the telephone set 200.

The device according to the invention allows, on the one hand, for the selection of characters which can be transmitted in the form of caption insertions into the television picture of a television programme by means of the television signal independently of a teletext system by means of the input panel 201 of the telephone set 200, the wireless transmission of selected characters to the microcomputer system 203 of the telephone set 200, the display of these characters in the display 202 in order to check that they are correct and the transfer thereof to the memory 204 in order to use the selected characters as required in a telephone network.

On the other hand, as is known, remote signals RS can be transmitted from the telephone set 200 to the television receiver 100.

The microprocessors of both devices can thus carry out a dialogue and exchange data automatically, the telephone set 200, which is advantageously a mobile telephone, simultaneously being designed and programmed in such a manner that it can be used instead of the remote control of the television receiver independently of a telephone network and can carry out at least the main functions thereof.

The device according to the invention has the advantage that neither the existing transmission standard for television transmission nor the standard relating to the telephone system has to be altered in order to establish the communication link.

The device according to the invention can be produced exclusively at the receiving end by the television receiver and telephone set manufacturer.

At the transmitting end, the probability of the correct recognition of caption insertions can be increased by using a preferred font, a preferred position for the beginning of the caption insertion in the FBAS signal and by using specific colours for characters and/or background.

E.g. the recording of names, addresses and call numbers in the non-volatile memory 205 of the telephone set 200 can be simplified by the device according to the invention. It is furthermore possible to actuate the automatic dialling device 206 of the telephone set 200 by means of temporarily stored call numbers transmitted by the television receiver 100 and, if desired, to transmit data, e.g. representing order numbers, customer, code or account numbers and also transmitted by the television

receiver 100, to a telephone channel of the telephone network by the touchtone dialling device 207.

By virtue of the development of the invention, a convenient display and management system for data present both in the memory of the microcomputer system 105 in the television receiver 100 and in the memories 204 and 205 of the telephone set 200 can be installed, e.g. in the microcomputer system 105, actuated by means of the cursor controller 123 and controlling and assisting the progress of a communication process. Required data inputs can thus be requested by the user and information produced as a result of the communication displayed and managed, on the one hand, in the conventional manner by the display 202 in the telephone set 200 and, on the other hand, substantially more conveniently using the screen 104.

A system of this kind can advantageously be used for running a business according to the principle of what is referred to as "teleshopping", in which an offer is made by a mail-order firm within a television programme and it is possible to initiate an order by telephone via a telephone network.

Before the telephone set establishes a connection with the firm via a telephone channel, a viewer can look at the data read out of the television signal by the reading device 109 and now found in the page memory 122 at his leisure via the special menu program stored in the program memory 121. This data may contain, e.g. the name of the firm, its call number, an order number for the goods, a designation and the price of the goods. For telephone ordering, however, the call number of the firm, the order number, the number of products to be delivered, possibly a size and the numbers of an association where the account is held, a customer number or a credit card number are required. The corresponding menu program supplements the required ordering data, in that it requests the viewer to enter, e.g. a piece number, size, colour choice and association where the account is held, establishes the telephone connection with the firm, transmits the data to the firm, waits for conformation if necessary and enters this data together with the data not required by the firm, such as name of the firm, price and designation of the goods, in a non-volatile memory in the television receiver 100.

A memory of this kind can advantageously contain the data format of a teletext page and the order is stored in the data format of a teletext page.

In a similar manner, the device according to the invention can be used to make transfers from the user's own account to another account.

This device furthermore offers the operator of premium television programmes according to what is referred to as a "pay TV system" the possibility of transmitting the corresponding code for decoding coded television signals of the pay TV system to a television receiver 100 for his own internal receiving decoder via a telephone network.

Legend

| | |
|-----|--------------------------|
| 100 | television receiver |
| 101 | HF receiving component |
| 102 | video signal component |
| 103 | picture tube |
| 104 | screen |
| 105 | microcomputer system |
| 106 | data bus |
| 107 | remote-control receiver |
| 108 | teletext component |
| 109 | reading device |
| 110 | gate circuit |
| 111 | analog/digital converter |
| 112 | pixel memory |
| 113 | read-out controller |
| 114 | analyser |
| 115 | microprocessor |
| 116 | character pattern memory |
| 117 | character transmitter |
| 118 | transmission element |
| 120 | teletext generator |
| 121 | program memory |
| 122 | page memory |
| 123 | cursor controller |
| 200 | telephone set |
| 210 | input panel |
| 202 | display |
| 203 | microcomputer system |
| 204 | volatile memory |
| 205 | non-volatile memory |

- 206 automatic dialling device
- 207 touchtone dialling device
- 208 coding and modulating device
- 209 infrared transmitter
- 210 receiving and transmitting device
- 211 data receiver
- 212 data decoder
- 213 data converter

Claims

1. Device for communication between:
 - a television receiver (100) with a screen (104) and a tuning and storage system in the form of a first microcomputer system (105) which can be operated by means of remote signals (RS), which receives a CVBS signal containing time intervals in which alphanumeric characters are transmitted
 - and a telephone set (200) with an input panel (201), a display (202) for alphanumeric characters, a second microcomputer system (203) with memories (204, 205), a coding and modulating device (208) for generating the remote signals (RS) for the television receiver (100) and an infrared transmitter (209) for transmitting the remote signals (RS), characterised in that the television receiver (100) contains:
 - a reading device (109) with a temporal data window which can be controlled by means of the first microcomputer system (105), and an analyser (114) for selecting and analysing the time intervals, for recognising the alphanumeric characters in the CVBS signal and for converting these characters into binary-coded characters,
 - and a character transmitter (117) for transmitting the binary-coded characters in the form of a data signal (DS) and that the telephone set (200) contains means (211, 212 and 213) for receiving and converting the data signal (DS) into characters which can be transmitted on a telephone channel in a telephone network and/or can be stored in the memories (204, 205) of the second microcomputer system (203).
2. Device according to claim 1, characterised in that the television receiver (100) which receives a CVBS signal containing time intervals corresponding to caption insertions with alphanumeric characters in the active part which can be displayed on the screen (104) has a reading device (109) containing the following components:
 - a gate circuit (110) with a read-out controller (113) for generating the data window in the form of time intervals in the CVBS signal,

- an analog/digital converter (111) connected to the output of the gate circuit for digitising the CVBS signal during the selected time intervals.
 - a pixel memory (112) for the digitised CVBS signal,
 - the analyser (114) for the stored CVBS signal connected to a character pattern memory (116) for reference structures of the picture signal of alphanumeric characters for recognising the characters in the stored CVBS signal by comparison with the reference structures and for generating corresponding binary-coded characters.
3. Device according to claim 1, characterised in that the character transmitter (117) has a coding and modulating device and a driver for actuating a transmission element (118) and is connected to the analyser (114) for wireless transmission of the data signal (DS).
 4. Device according to claim 3, characterised in that the character transmitter (117) has a coding and modulating device for converting the binary-coded characters into serial pulse words and the transmission element (118) is an infrared light-emitting diode.
 5. Device according to claims 1 and 2, characterised in that the reading device (109) contains a still frame signal generator connected to a cursor control system in the signal path between the pixel memory (112) and the analyser (114) for imaging the CVBS signal read out and stored on the screen (104) and for marking alphanumeric characters.
 6. Device according to claims 1 and 2, characterised in that the reading device (109) contains means for increasing the contrast in front of the pixel memory (112) in the signal path, these means shifting the distribution of the brightness and/or colour values in the luminance and/or chrominance signal towards extreme values.
 7. Device according to claim 1, characterised in that a teletext generator (120) is connected to the data bus (106) of the first microcomputer system (105) in the television receiver (100) for generating teletext pages from the binary-coded data. connected to a program memory (121) for programs for generating teletext pages

and a page memory (122) for teletext pages and a cursor controller (123) for marking parts of teletext pages.

8. Device according to claim 1, characterised in that the television receiver (100) has a device for marking and reading out characters from the teletext component (108) which is also connected to the character transmitter (117).
9. Device according to claim 1, characterised in that the microcomputer system (203) in the telephone set (200) contains a program circuit for transmitting alphanumeric characters instead of the remote signals (RS) via the coding and modulating device (208) and the infrared transmitter (209) and that the microcomputer system (203) in the television receiver (100) has a program circuit for imaging the alphanumeric characters on the screen (104).

4 pages of drawings

FIGURE 1

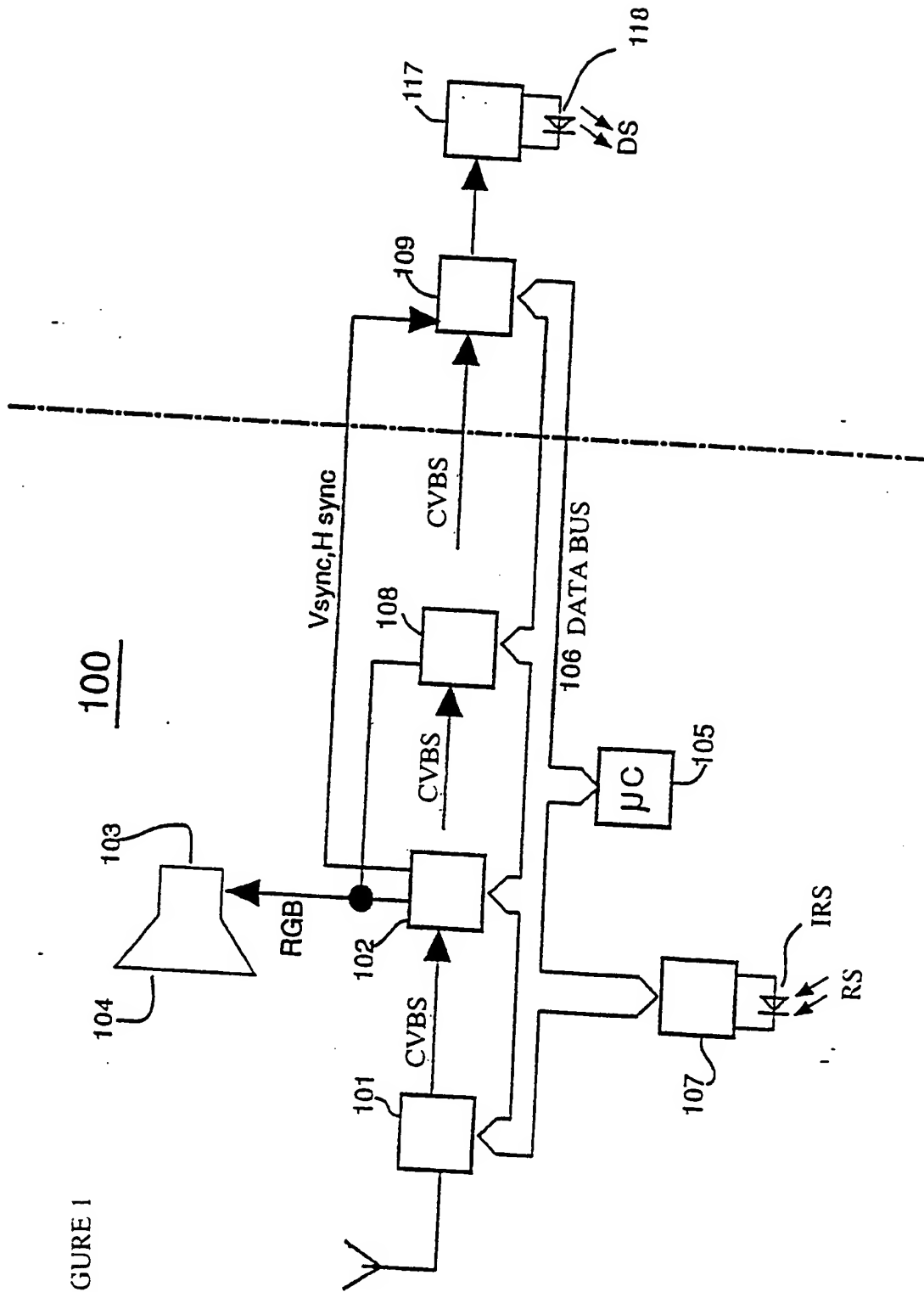


FIGURE 2

109

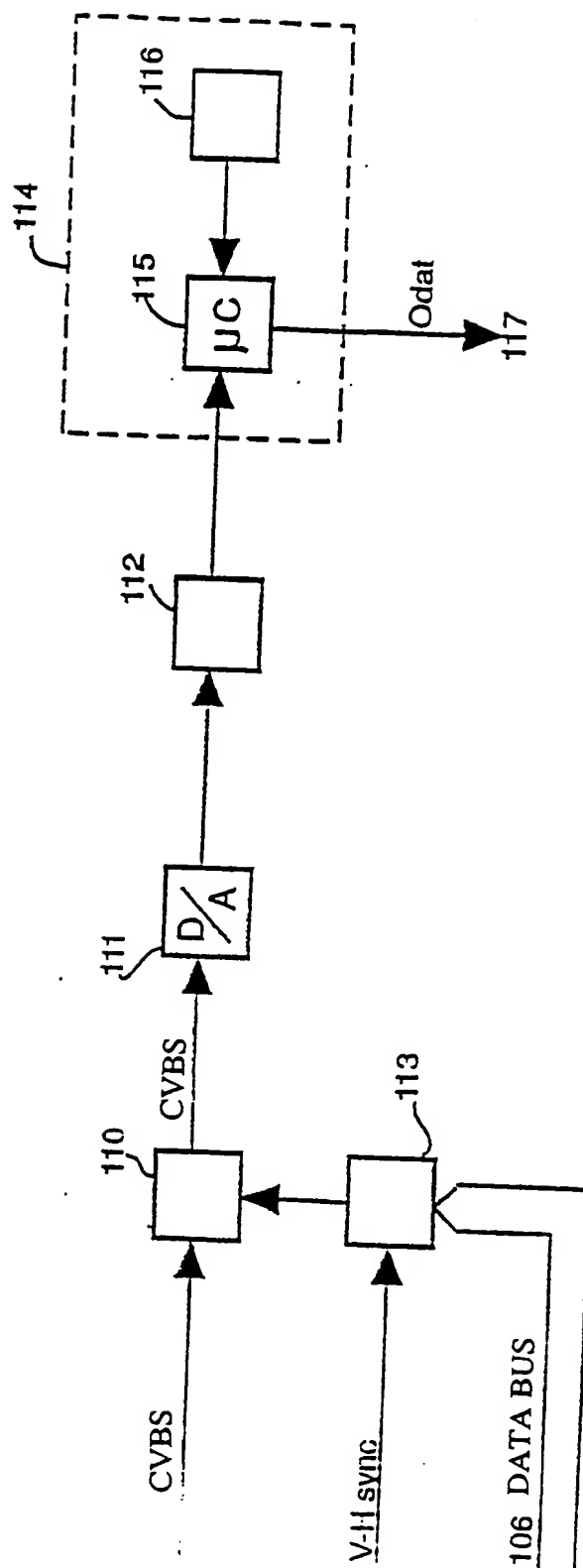


FIGURE 3

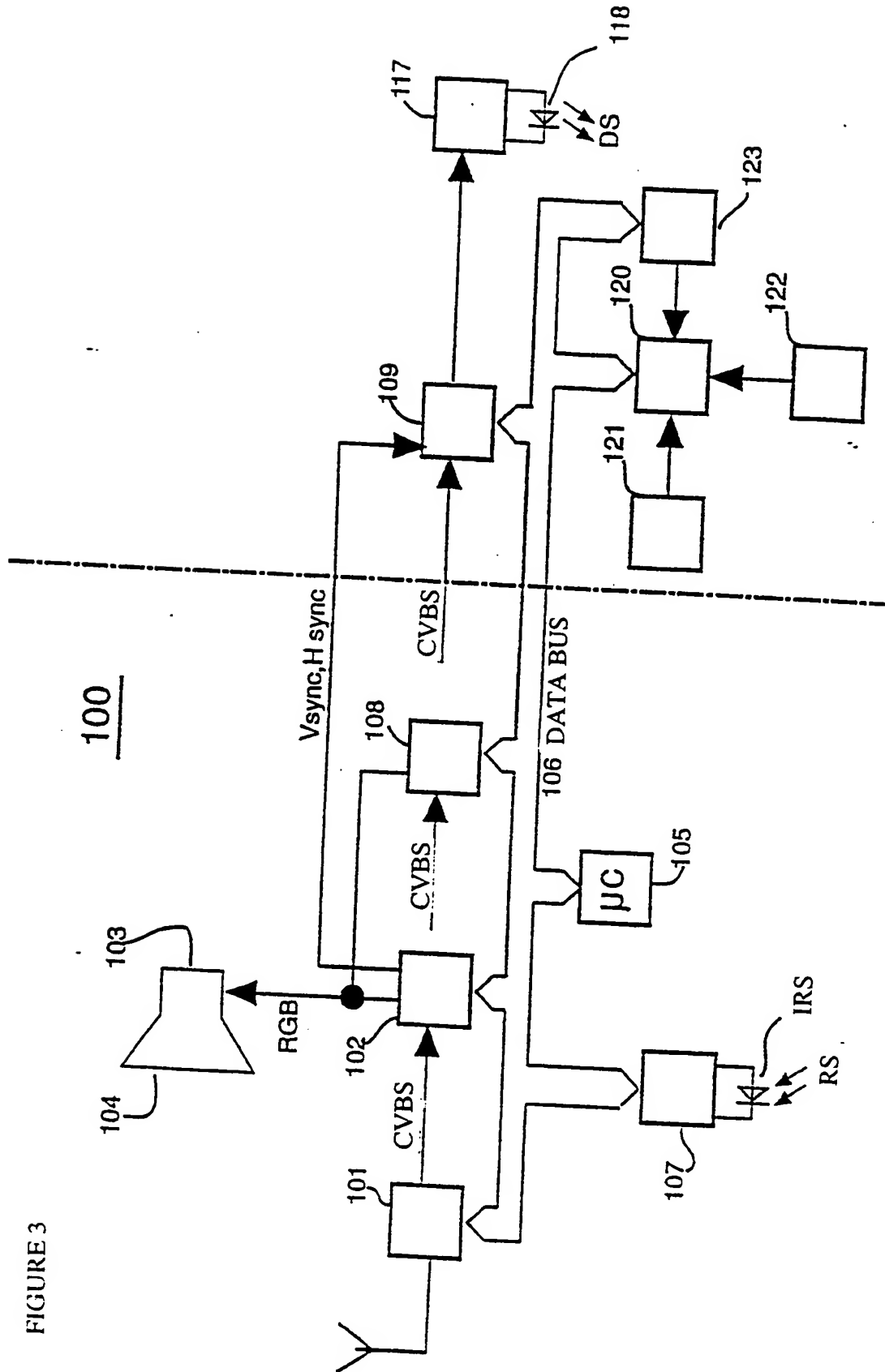
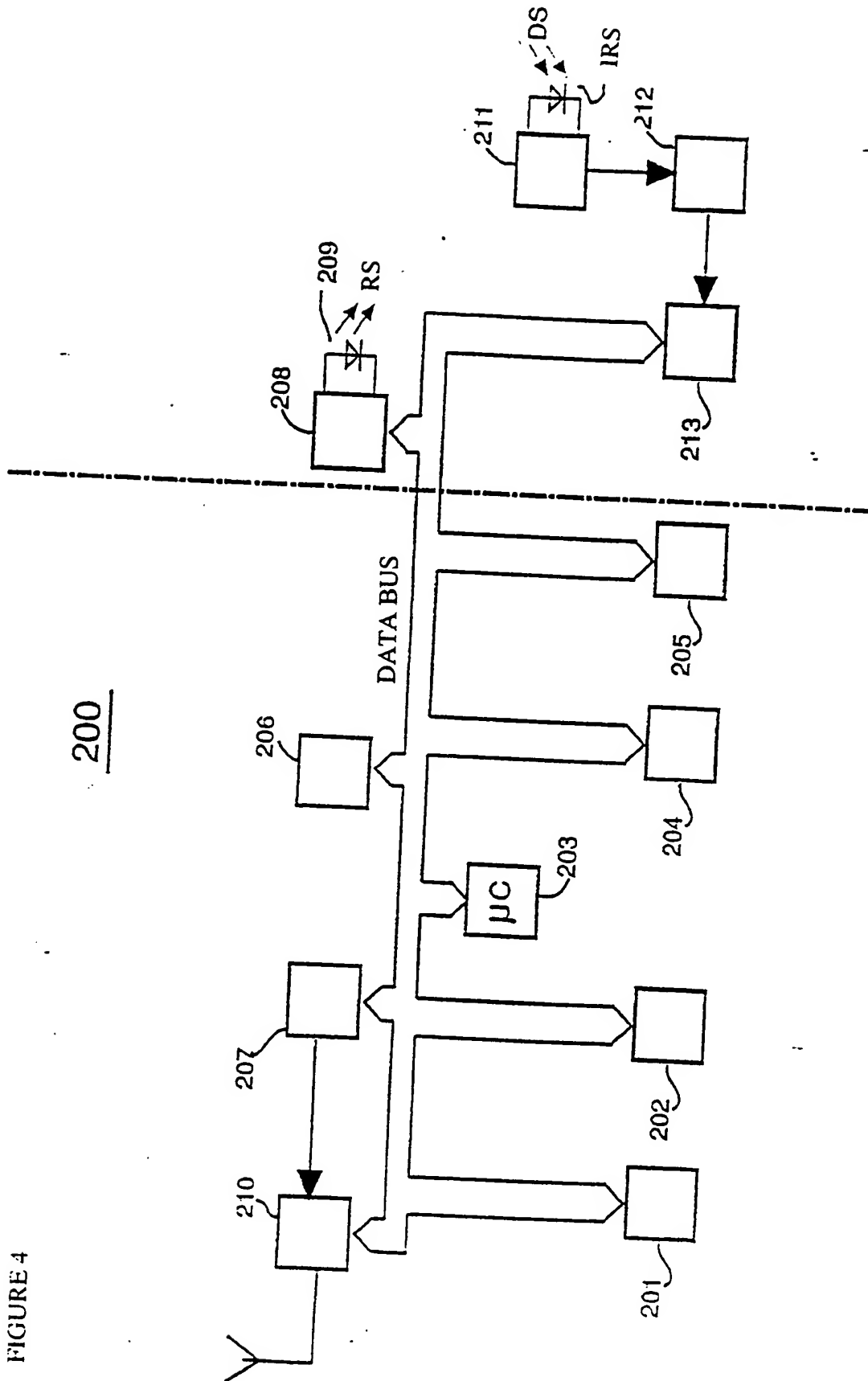


FIGURE 4

200



**This Page is Inserted by IFW Indexing and Scanning
Operations and is not part of the Official Record**

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images include but are not limited to the items checked:

- ☒ **BLACK BORDERS**
- ☐ **IMAGE CUT OFF AT TOP, BOTTOM OR SIDES**
- ☐ **FADED TEXT OR DRAWING**
- ☐ **BLURRED OR ILLEGIBLE TEXT OR DRAWING**
- ☐ **SKEWED/SLANTED IMAGES**
- ☐ **COLOR OR BLACK AND WHITE PHOTOGRAPHS**
- ☐ **GRAY SCALE DOCUMENTS**
- ☐ **LINES OR MARKS ON ORIGINAL DOCUMENT**
- ☐ **REFERENCE(S) OR EXHIBIT(S) SUBMITTED ARE POOR QUALITY**
- ☐ **OTHER:** _____

IMAGES ARE BEST AVAILABLE COPY.

As rescanning these documents will not correct the image problems checked, please do not report these problems to the IFW Image Problem Mailbox.